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GEOPHYSICAL ABSTRACTS

NO. XII.

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BY

FREDERICK W. LEE

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April, 1930.

INFORMATION CIRCULAR

DEPARTMENT OF COMMERCE -- BUREAU OF MINES

GEOPHYSICAL ABSTRACTS[1]

No. 12

Compiled by Frederick W. Lee[2]

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1. GRAVITATIONAL METHODS

BRUNS' TERM AND THE MATHEMATICAL EXPRESSION FOR THE GRAVITY ANOMALY

By Walter D. Lambert

Gerlands Beiträge zur Geophysik, vol. 24, No. 4, 1929, pp. 371-377.

In this article Lambert examines the following two papers published by Hopfner: (1) Zur Begründung der Lehre von der Isostasie (The basis of the theory of isostasy), and (2) Ueber die Wirkung der Undulationen auf die Grösse der Scheinbaren Schwerkraftstörung (On the effect of undulations of the geoid upon the value of the apparent perturbation of gravity) (See Geophys. Abs. No. 11). Lambert's viewpoint is summed up by him as follows: "Hopfner's conclusion as to the relative magnitudes of the direct effect of irregularities in the distribution of matter and the corresponding indirect effect due to a warping of geoid appear to be unfounded, the error arising from the omission of an important term in the calculation of the direct effect. It is shown that the free-air gravity anomaly and the elevation of the geoid above the spheroid are in general of the same sign. The usual interpretation of gravity anomalies therefore holds good, also the usual arguments based on them in favor of the existence of fairly complete isostatic compensation."

Two remarks concerning Lambert's article, one by Hopfner in which he explains the reason for the difference between the well-known Stockes' formula and that given by Hopfner himself, and another by Lambert in which he defends his viewpoint, are published in the same number of "Gerlands Beiträge zur Geophysik."--W. Ayvazoglou.

THE MEASUREMENT OF THE SECOND DERIVATIVES OF THE GRAVITATIONAL POTENTIAL OVER A BURIED ANTICLINE

By T. H. Jones and R. Davies

Monthly Notices of the Royal Astronomic Society, Geophysical Supplement, vol. 2, No. 1, 1928, pp. 1-32.

The paper deals with the measurement of the second-order derivatives of the gravitational potential over a buried anticline. During the early part of the work many instrumental difficulties were encountered. These were mostly caused by the rapid temperature fluctuations during the night in southwest Persia, where the investigation was carried out. The magnitude and direction of the gravitational force due to the underground mass have been obtained at a number of points on the surface.

The dimensions of the anticlinal mass, and approximate values for the densities of the two uppermost media, have been deduced from the measurements.--Authors' abstract.

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THEORY OF A. SCHMIDT'S HORIZONTAL FIELD BALANCE

By C. A. Heiland

American Institute of Mining and Metallurgical Engineers, Geophysical Abstracts, 1929, pp. 261-315.

Heiland gives a detailed description of the vertical and horizontal magnetometers. The principal formula for both vertical and horizontal balance for any azimuth and inclination is derived. The theory of various influences that affect the readings are examined. These influences are: (1) False orientation; (2) improper leveling; (3) auxiliary magnets; (4) changes in vertical intensity (latitude and anomalies); (5) changes in gravity (latitude and anomalies); (6) temperature on readings in general, on the scale value and on auxiliary magnets; (7) shape of the knife-edge on subsequent readings and scale value; and (8) optical influences.

The operation of the instrument, as well as the computation of the results, is described.--W. Ayvazoglou.

GRAVITATIONAL METHOD OF PROSPECTING

(In Serbian)

By D. V. Frost

Rudarski i Topionicki Vesnik (Bulletin of Mining and Metallurgical Industry) Belgrade, vol. 1, No. 12, 1929, pp. 531-539.

A brief mathematical theory of the gravitational method of prospecting is given.--V. Gorsky.

2. MAGNETIC METHODS

MAGNETOMETRIC METHOD FOR PROSPECTING DEPOSITS OF LOW MAGNETIC PERMEABILITY

(In Serbian)

By D. V. Frost

Technichki List (Technical Paper), Zagreb, No. 9, 1929, pp. 136-142.

In this article Frost describes the instruments used for examining low magnetic anomalies.

Schmidt's vertical and horizontal variometer and the portable magnetic theodolite manufactured by the Askania Werke. Their mathematical theory is given. The theory of Schmidt's vertical variometer differs in some details from that given by C. Heiland in his article published in "Zeitschrift fuer angewandte Geophysik, 1926.--V. Gorsky.

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MAGNETOMETRIC METHOD, ONE OF THE BEST APPLICABLE GEOPHYSICAL METHODS FOR PROSPECTING ORE DEPOSITS IN YUGOSLAVIA

(In Serbian)

By D. V. Frost

Rudarski i Topionicki Vesnik (Bulletin of Mining and Metallurgical Industry), Belgrade, vol. 1, No. 1, 1929, pp. 13-15.

Examining the geophysical methods of prospecting from the viewpoint of simplicity and cheapness, Frost draws the conclusion that under the conditions of Yugoslavia, the magnetometric method may be applied with the best success.--V. Gorsky.

OSSERVAZIONI SU ALCUNI RELIEVI GEOMAGNETICI NELLA PIANURA DEL PO

(OBSERVATIONS ON THE GEOMAGNETIC RELIEFS IN THE PLAIN OF THE PO)

By Arnaldo Belluigi

Gerlands Beitrage zur Geophysik, vol. 24, No. 4, 1929, pp. 337-342.

Some considerations on earth Magnetic reliefs carried out with Schmidt's balance in the plain of the Po for the discovery of mineral deposits are given. The author indicates the improvements attained during the survey by which small anomalies, which could not be interpreted so far, could be easily explained.

Finally the author shows how elements can be calculated from the results of the survey accomplished which, in connection with the gravimetric results obtained, may serve for the completion and modification of these results.--Author's abstract translated by W. Ayvazoglou.

MAGNETOGRAM SERVICE IS INAUGURATED

By L. G. E. Bignell

The Oil and Gas Journal, vol. 28, No. 41, 1930, pp. 41, 119, 120.

In this article the author states that regular reports of magnetic storms will be published in the Oil and Gas Journal for the benefit especially of the geophysical departments of companies doing the magnetometer work.

A sample of such information printed in the form of a telegram is given. The Tucson magnetic observatory of the United States Coast and Geodetic Survey will be in charge of furnishing this information.

The three components of the earth's magnetic field (declination in degrees and minutes, horizontal intensity, and vertical intensity) are continuously observed in the observatory; the instruments installed for this purpose

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are briefly described and a sample of magnetogram showing the record of a magnetic storm is given.

A list of articles published by L. Spraragen covering the use of the magnetometer surveys made in several States is added.--W. Ayvazoglou.

CERTAIN ASPECTS OF MAGNETIC SURVEYING

By L. B. Slichter

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 238-261.

In classifying rocks magnetically, the inert, highly magnetic, and intermediate types are briefly discussed, and the peculiar importance of a few of the ferric minerals, and especially magnetite, is explained. Experimental evidence shows that the susceptibility of magnetite changes greatly as the field strength is changed, and that it also depends greatly on the form in which the magnetite occurs. The hitherto accepted values appear far too low. For fields as weak as the earth's a value of about 0.3 is obtained for disseminated magnetite, while for the solid material a value of 1.5 to 3.0 or higher appears correct.

Three instances are given of the fact that field observations of intensity are often much in excess of those which can well be accounted for by accepted values of the susceptibility. In each case the higher values here advocated appear adequate to account for the observed results.-- in two cases it is shown that there is a satisfactory quantitative agreement between observed magnetic data and the form and size of the known ore body which caused the magnetic response.--Author's abstract.

MAGNETOMETRIC INVESTIGATION OF GOLD PLACER DEPOSITS NEAR GOLDEN, COLORADO

By C. A. Heiland and W. H. Courtier

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 364-385.

The principal purposes of the investigations described by the authors in this article consisted of:

1. Repeating with modern, more sensitive, and more reliable instruments, the magnetometric placer investigations made previously.

2. Disproving the recently advanced theory that deposits of the glacial period have no pronounced magnetic effects.

3. Developing in detail the theory of the magnetic effects produced by placer deposits.

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The magnetic field balances for vertical and horizontal intensities which were designed by Schmidt were used for a detailed topographic and magnetometric survey.

The results of the investigation are discussed.

In conclusion the authors express the hope that more examples showing the relation of magnetic anomalies to geologic structure be published in order to avoid the serious mistakes often made in the interpretation of the results.--W. Ayvazoglou.

3. SEISMIC METHODS

VIBRATION RESEARCH AT STANFORD UNIVERSITY

By Lydik S. Jakobsen

Bulletin of the Seismological Society of America,
vol. 19, No. 1, 1929, pp. 1-28.

The importance of studying the application of the principles of elastic vibrations has caused the construction at Stanford University of a vibration laboratory equipped mainly with a shaking table for carrying out experiments.

The present paper deals with the characteristics of such a shaking table. The purpose of the paper is to make seismologists and engineers acquainted with the properties of the shaking table in order that suggestions for the improvement of the machine and for model-testing may be offered.

After a discussion of the requirements which a shaking table should answer, Jakobsen gives a brief description of the shaking table built at Stanford University. It reads as follows:

> The shaking table at Stanford University consists of a heavy platform mounted on four street-car wheels, and anchored by springs to heavy concrete piers. The platform is made of eight-inch H-beams, bolted and welded together; its dimensions are ten by twelve feet with a weight of approximately six thousand pounds. In order to reduce the friction of the table motion to a minimum, the street-car wheels have been ground concentrically with their axles and have been mounted on ball bearings. The anchoring springs are of the helical type and may be fastened to the truck and to the piers in such a way that they work on compression only. At first a single anchoring spring was used but the difficulty in designing a simple fastening that would insure a constant spring characteristic for extension, as well as for compression, led to the adoption of several anchoring springs on opposite ends of the platform. A figure shows the second design after three anchoring piers had been built.
>
> The impact type of motion is communicated to the vibration table by the following device: A heavy pendulum, approximately eleven

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hundred pounds and seventeen feet long, is hoisted to a certain height and then released so that, in its maximum velocity position, it strikes a bumper spring which is fastened to the vibrating platform. The pendulum, returning from its impact with the bumper spring, is arrested in its upper recoil position by a trailing pawl, and therefore does not interfere with the free vibrations of the platform after its first contact with the bumper spring. A figure shows the pendulum with its releasing and arresting mechanisms.

Discussion of the impact motion of the shaking table, analysis of the transitory motion of an elastic model placed on the shaking table, discussion of the continuous motion of the shaking table, the type of damping and the problem of dynamic similitude form the theoretical part of the article.--W. Ayvazoglou.

THE ELASTIC PROPERTIES OF CERTAIN BASIC ROCKS AND THEIR CONSTITUENT MINERALS

By L. H. Adams and R. E. Gibson

Proceedings of the National Academy of Sciences of the United States, vol. 15, No. 9, 1929, pp. 713-724.

The authors have measured directly, at pressures between 2,000 and 12,000 megabaryes, the cubic compressibility of the minerals labradorite, jadeite, grossularite and almandite, and of diabase rocks (note: the word "diabase" is used in the American sense to indicate a holocrystalline basalt; it should be understood by British readers to mean "dolerite") from Sudbury, Canada; Frederick, Maryland; and the Whin Sill in the north of England. By combining these mineral results with those already known, the authors were able to give a table of the compressibilities, at various pressures, of all the important constituents of basic rocks, to compare the compressibilities of the rocks with those of their constituent minerals, and to conclude that the compressibility calculated from the mineral content gives a limit to which that of the rocks approaches at high pressure. The results obtained demonstrate, furthermore, that at 15,000 megabaryes and 30°C. the maximum velocity of longitudinal elastic waves through rocks of basaltic composition and mode is 7.4 kilometers per second. On the other hand, the compressibilities of garnet and jadeite, being found to be surprisingly low, lead to the conclusion that magmas of this composition, crystallized primarily as, or subsequently metamorphosed to eclogites, may transmit longitudinal waves with velocities exceeding 8 kilometers per second. Bearing in mind that the pressures existing at 20, 40, and 60 kilometers below the surface of the earth are somewhat greater than 5, 10, and 15,000 megabaryes, respectively, the connection between these observations and deductions concerning the composition of the interior of the earth may be readily seen. Indeed, the existing data, in the opinion of the authors, place the possible components of the earth, below 60 kilometers and above the core, in the following ascending order of probability: holocrystalline basalt, eclogite, pendotite.--Authors' abstract.

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4. ELECTRICAL METHODS

MESSUNG DES LEITVERMÖGENS DER ERDE FÜR KURZE ELEKTRISCHE WELLEN

(MEASUREMENT OF THE CONDUCTIVITY OF THE EARTH FOR SHORT ELECTRIC WAVES)

By M. T. O. Strutt

Die Naturwissenschaften, vol. 17, No. 37, 1929, pp. 727-728.

The author describes a method for measuring the earth's conductivity based on the measurement of radiation:

The receiver was suspended 13 meters distant from the transmitter at a height of about 15 meters. The transmitter was moved upward and downward, thus producing oscillations in the intensity of receiving caused by the interference of the radiation received directly and that received by reflection. Therefore the intensity of receiving was registered as a function of the height of the transmitting antenna. From the curve obtained the coefficient of reflection of the earth was calculated and from the latter the conductivity could be computed.

The transmitter was a short-wave tube-oscillator producing waves 1.42 meters long. The high-frequency current was modulated to 435 cycles.

The receiver consisted of a tube-detector with low-frequency booster (435 Hertz). The last intensifying step was connected with a tube-voltmeter.

The result of the measurement is shown in a curve. The specific resistance of the ground was measured. Experiments with different kinds of ground will be published by the author later.--W. Ayvazoglou.

THE PHYSICAL BASIS OF THE METHOD OF EQUIPOTENTIAL LINES

(In Russian)

By V. Bursian

Comité Géologique, Matériaux pour la géologie générale et appliqué, No. 137, Leningrad, 1929, pp. 5-37.

In this article Bursian discusses the physical foundations for the application of electricity for prospecting mineral deposits. He describes the methods generally used, giving preference to that of two parallel linear electrodes proposed by Lundberg.

The theory of measurements of the potential in the field by connecting a potentiometer to two opposite points on the electrodes is examined.

Bursian concludes that, although the method of equipotential lines can not replace entirely the usual methods of prospecting or be used for studying

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the deposits already established, it may successfully serve for a rapid and cheap investigation of large areas.

The anomalies found by this kind of prospection may greatly reduce the area of investigation.

The purpose of this article is to form a basis on which the experiments on the electric fields in a tank filled with water and provided with models of ore bodies were carried out by Dedushkevich, Rodionov, and Sofronov (see the following three articles.)--W. Ayvazoglou.

EXPERIMENTS MADE ON THE ELECTRIC FIELDS IN A TANK FILLED WITH WATER AND PROVIDED WITH MODELS OF ORE BODIES

(In Russian)

By S. Dedushkevich

Comité Géologique, Matériaux pour la géologie générale et appliqué, No. 137, Leningrad, 1929, pp. 37-49

Experiments on models of ore bodies have been carried on by the author since 1924 at the State's Physico-Technical Laboratory in Leningrad.

A brick tank 2 by 2 meters by 1 meter was constructed for these experiments. The electrodes consisting of two thin parallel wires 1 meter long and 1 meter apart were placed upon the surface of the water. The square field between the electrodes was explored by means of an exploring coil fastened to a pantograph by which the various positions of the coil were transferred to the plan in natural scale. Alternating current obtained from a lighting circuit (50 cycles) through a lowering transformer was applied.

Between the clasps of the transformer a potentiometer was inserted. A telephone was introduced (through a three-tube amplifier) in the circuit of the sounding apparatus, and its positions corresponding to the minimum of audibility were found. By plotting these points on the plan it was possible to trace the equipotential lines corresponding to the potential value chosen on the potentiometer. The models consisted of metal plates immersed in water.

The results of the experiments are presented in a series of diagrams and tables, and a general view of the arrangement of the experiment is given.--W. Ayvazoglou.

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EXPERIMENTS ON MODELS OF ORE BODIES OF DIFFERENT CONDUCTIVITY INSERTED INTO A TANK FILLED WITH WATER

(In Russian)

By S. Dedushkevich

Comité Géologique, Matériaux pour la géologie générale et appliqué, No. 137, Leningrad, 1929, pp. 49-53.

This paper comprises a description of the continuation of the experiments carried on by the author in previous years (see the abstract above); it is devoted to investigation of the way in which the relation of the objects electrical conductivity to that of the inclosing medium influences the intensity of the indications. In the experiments described in the first paper of Dedushkevich that relation is, roughly estimated, equal to 10^{10}, or practically infinitely large. In order to investigate the question experimentally, the properties of gelatin jelly, as well as of common salt (NaCl) of various concentration, were examined. In taking a gelatin concentration equal to 2 per cent and that of the salt equal to 0, 0.5, 2 and 6 per cent, ratios of the specific resistances of such jellies to that of ordinary water equal to 20, 100, 600, and 1,300 could be obtained. A wooden cylinder, 500 meters long, with an internal diameter of 60 millimeters and walls 10 millimeters in thickness was filled with these solutions. The electrical conductivity of wood impregnated with water differs little from that of water and the thickness of the walls was sufficient, as shown by the experiments, to prevent diffusion during the experiments.

The results of the experiments are given in diagrams. The relative change of the gradient with respect to the normal one for the previously relations of electrical conductivities due to an immersion of the cylinder in horizontal position to a depth of 35 millimeters proved to reach respectively: 1.25; 2; 6; 7. One may conclude that the ratio 100 will produce an effect which may not be sufficient for obtaining positive results from the electric investigation. The objects of investigation must differ in conductivity from the sphere surrounding them at a ratio up to several hundreds.--W. Ayvazoglou.

EXPERIMENTS ON MODELS CARRIED OUT IN 1927 AND 1928

(In Russian)

By P. Rodionov and N. Sofronov

Comité Géologique, Matériaux pour la géologie générale et appliqué, No. 137, Leningrad, 1929, pp. 53-71.

The experiments described in this paper are a continuation of experiments carried on by Dedushkevich and reported in the article entitled "Experiments Made on the Electric Fields in a Tank Filled with Water and Provided with with Models of Ore Bodies" given previously in this group of abstracts.

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This time the authors tried to come as close as possible to natural conditions under which the ore bodies are usually found, therefore the sizes, reciprocal distribution, and forms of models were chosen accordingly.

A series of experiments in tanks was made in order to establish the influence of ore bodies upon the distribution of the current:

1. In case of a system of parallel bodies without inclination.

2. With regard to the thickness (magnitude) of the ore body.

3. In case of a system of inclined parallel bodies.

4. With regard to the depth of an ore body.

5. Concerning the position of an ore body with regard to the electrodes.

The results of the experiments are given in a series of diagrams and tables.--W. Ayvazoglou.

DEPTH ATTAINABLE BY POTENTIAL METHODS OF ELECTRICAL EXPLORATION

By Conrad and Marcel Schlumberger

The American Institute of Mining and Metallurgical Engineers, Technical Publication No. 315, 1930, pp. 1-9.

The object of this paper is to clarify the idea, so important when exploring by potential methods, of the depth of investigation attainable by electrical measurements. After defining, with some precision, the term "depth of investigation" in geophysics, the authors show how it is possible to regulate this depth in potential methods and to obtain an "electrical drilling" from surface observations. They consider also the difficulties encountered in deep measurements and indicate how it is possible to reach greater depths than those having an industrial interest.--Authors' abstract.

ELECTRICAL STUDIES OF THE EARTH'S CRUST AT GREAT DEPTHS

By Conrad and M. Schlumberger

The American Institute of Mining and Metallurgical Engineers, Technical Publication No. 315, 1930, pp. 10-16.

The authors' experiments at Vitré in 1928 should be considered as only a first attempt to measure, by surface potentiometric observations, the resistivities of deep-lying formations of the earth's crust. Although the figures obtained give only an order of magnitude, they demonstrate the possibility of solving the problem. It must be noted that a small expenditure of energy, not over a few hundred watts, suffices to electrify a volume of ground

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containing over one million cubic kilometers so as to produce a measurable drop of potential.

The authors are convinced that these studies should be resumed and enlarged, since they are one of the few possible ways of investigating the deep regions of the earth's crust.--Authors' abstract.

ABSORPTION OF ELECTROMAGNETIC INDUCTION AND RADIATION BY ROCKS

By A. S. Eve

The American Institute of Mining and Metallurgical Engineers, Technical Publication No. 316, 1929, pp. 1-11.

The main factors by which the possibility of detecting ore underground are determined are summed up by the author in his preface to the article as follows:

1. The depth of the ore beneath the surface.

2. The magnitude of the conducting ore body.

3. The excellence of the conductivity of the ore body as compared with that of the surrounding strata.

4. The frequency of the alternating current.

5. The loss of effect of absorption, due to the properties of the strata that overlie the ore body and extend to the earth's surface. This absorption depends upon: (a) The frequency of the alternating current, (b) the conductivity of the strata, (c) permeability of the strata and (d) their dielectric constant.

In the first part of this article the author gives a brief summary of theory on radiation waves; tables showing (1) the penetration for different frequencies, and (2) the depth of penetration of radio waves and a diagram (penetration of radio waves in earth, showing thickness in meters to half value) are added. The second part of the paper describes the experiments carried out under the joint auspices of the U. S. Bureau of Mines and the Geological Survey of Canada in Mammoth Cave, Kentucky, in June, 1929.

A brief note of the work given by the author, reads as follows:

> The Mammoth Cave was selected by Dr. F. W. Lee on account of the entire absence of metallic conductors. The entrances were far removed from the stations selected for research. The exits were water sealed by the Echo River. The overburden consisted of horizontal layers of sandstone and limestones about 300 feet thick. The resistances of these materials were determined in place by the one-electrode probe method. The limestone had a resistivity of about 100,000 ohm-cm. and the sandstone of about 200,000 ohm-cm.

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In River Hall, 300 ft. beneath the surface, we received Morse signals from about six long-wave stations bearing N. 65 E. Using a long horizontal antenna (300 ft.) we also received audible broadcasting of speeches and music from a loud speaker. The sending stations were Cincinnati (429 m., 700 kc.) 200 miles away N. 36° E.; Louisville (366 M., 820 kc.) 90 miles away S. 10° W.; and Nashville (461 m., 650 kc.) 100 miles away N. 36° E. These signals unquestionably came through the rocks. Horizontal and vertical loops were placed on the surface of the ground and were stimulated with alternating current of frequencies varying, by steps of 10, from 20 to 110 kc. The received voltage in the coils immediately beneath in the cave 300 ft. below was measured in microvolts, and the superiority of the lower frequency, and of the longer wave length was confirmed.

Finally audiofrequency (500 cycles) alternating current (2.3 amp.) was passed round a 10-turn loop (100 ft. diameter) of insulated wire resting on the earth's surface.

With a receiving coil and head-phones, without amplification, it was possible, 300 ft. underground, to find the point under the center of the loop, thus verifying our survey of the cave. On traversing the cave with the coil we were able to detect the effects of the loop 800 ft. away horizontally, so that the electromagnetic effects were passing through 900 ft. of rock.

The author expresses the desire that the work which so far may be considered of a pioneer character only, be continued.--W. Ayvazoglou.

MAPPING OIL STRUCTURES BY THE SUNDBERG METHOD

By Theodor Zuschlag

The American Institute of Mining and Metallurgical Engineers, Technical Publication No. 313, 1930, pp. 1-16.

The basic principle of electromagnetic prospecting in its application to geologic structure is the measurement of the electromagnetic field resulting from currents set up in strata which, due to their content of saline solutions, are of high electrical conductivity. This permits the determination of the depth of these strata, and consequently their elevation can be decided at a sufficient number of points to give their dip and strike and thus determine the form of geologic structure present.

Following a brief nontechnical discussion of the principles involved, diagrams of the electrical indications resulting from typical geological structures are given, followed by maps showing the actual results of electrical surveys over a salt dome and a faulted area, respectively.

These results are then compared with the evidence derived from drill- and the electrical prospecting results are shown to be constant with the geology.--Author's abstract.

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CERTAIN APPLICATIONS OF THE SURFACE POTENTIAL METHOD

By Warren Weaver

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 68-87.

This is a report on the work of the author on surface potential methods. General principles of the measurements, as well as the interpretation of the curves, are explained. Diagrams and one table showing the per cent of saturation effect for various ratios of conductivities are added.--W. Ayvazoglou.

RECENT RESULTS IN ELECTRICAL PROSPECTING FOR ORE

By Hans Lundberg

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 87-125.

An outline of a general knowledge of the methods and principles involved in preparing and interpreting results obtained in the field is given. Method of electrical prospecting illustrated by a series of diagrams is discussed, and the apparatus and operations are explained. Essentials of the success of electrical methods in serving the mining industry are given as follows: (1) Methods developed to such a degree that the properties of electrical and electromagnetic fields can be correctly determined; (2) knowledge of the strength and character of the influences thereon of ore bodies; (3) experience in interpreting the results; and (4) knowledge of geology.

In the second part of the article Lundberg discusses a few results from different districts in the light of local geology and conditions. The results of surveys in the following districts are mentioned:

1. Survey in the zinc-lead district in the upper Mississippi Valley. Conclusion: The results obtained in this district can not be considered entirely satisfactory, the main difficulty being the low conductivity of the ore.

2. Survey in the Southwest. Conclusion: Conditions for electrical prospecting are limited.

3. Survey in northern California. Conditions favorable for electrical prospecting; some surveys using electromagnetic methods have been carried out.

4. Survey in British Columbia. In general the conditions are favorable, although the topography often is very rough.

5. Survey in Coeur d' Alene district. Conditions generally favorable for electrical prospecting as the veins carry a sufficient amount of conducting sulphides.

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6. Survey in northern Manitoba. Electromagnetic methods were used. The accuracy of the survey was well checked by diamond drilling conducted afterwards.

7. Survey in northern Ontario. Electrical prospecting has been executed in the Sudbury Basin and tried out in the Cobalt district.

8. Survey in Rouyn district, northern Quebec. The conditions looked at first sight ideal for electrical prospecting, but in working in the district certain adverse conditions became evident.

9. Prospecting in Newfoundland. Conclusion: The value and usefulness of electrical prospecting has been abundantly proved in this district, and it is doubtful whether here the ore bodies would ever have been located without this method.--W. Ayvazoglou.

SOME APPLICATIONS OF POTENTIAL METHODS TO STRUCTURAL STUDIES

By E. G. Leonardon and Sherwin F. Kelly

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 180-199.

The authors present briefly some examples of the practical application of the potential methods to geological studies. The examples are chosen from a number of problems solved in the field.

Fundamental points are briefly stated before the field operations and interpretations are described. The authors draw the conclusion that the varied problems discussed in this paper show that it would be erroneous to assume that the potential methods are limited to the search for metallic ores. The field of applicability in structural work is at least of equal importance. The results obtained prove that the method has passed from the experimental stage to the realm of practical use.--W. Ayvazoglou.

ELECTRICAL PROSPECTING APPLIED TO FOUNDATION PROBLEMS

By Irving B. Crosby and E. G. Leonardon

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 199-211.

This article presents results of electrical prospecting to determine the depth to rock at various points obtained for the preparation of a contour map showing the bed-rock surface and outlining the buried gorge in the vicinity of the site of a large dam on the upper Connecicut River. The results of electrical determinations directly checked by the drill are shown in a table.

Five out of the 10 determinations are accurate within 5 per cent or less, three within 20 per cent, and two are bad; the errors of the latter are explained by the authors as due to special conditions.--W. Ayvazoglou.

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DISCOVERY OF SALT DOMES IN ALSACE BY ELECTRICAL EXPLORATION

By G. Carrette and Sherwin F. Kelly

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 211-221.

The purpose of the work carried out by the authors in the Oligocene potash basin of Alsace consisted of supplementing by an electrical survey the geological data collected thus far. Salt domes, absolutely unknown in that region heretofore, were established, and two of them, one near Meyeheim and another near Hettenschlag, were actually outlined.

In this paper the authors indicate the stratigraphic and structural conditions of the area where these salt domes were found, discuss the results of the electrical survey which led to the location of the domes, and indicate the new geological outlook which such a discovery suggests.--W. Ayvazoglou.

UEBER DAS GRUNDPROBLEM DER ANGEWANDTEN GEOPHYSIK UND DEN ELEKTRISCHEN NACHWEIS VON ERDÖL

(ON THE FUNDAMENTAL PROBLEM OF APPLIED GEOPHYSICS AND THE ELECTRICAL METHOD OF PROSPECTING FOR OIL)

By H. Löwy

Die Naturwissenschaften, vol. 15, 1927, p. 921.

The guiding idea of Löwy a scientist well known by his works on dynamic methods of prospecting, is expressed in this article as follows:

"I think that not cooperation but, on the contrary, emancipation from this cooperation--that is, emancipation from geology--is the task of applied geophysics. Only in this case will it be possible to expand the investigation to those extensive domains for which there exist no geological maps or only very poor ones, that is, to those domains in which geophysical investigations are most needed."

His further conclusion is that a detailed analysis of deposits in dry areas can be made by use of the method of electric oscillations. Without taking into consideration the fact that the method of electric oscillations is not yet sufficiently worked out and proved so as to be of value for practical use, the fundamental idea of the author presents a certain extreme by which applied geophysics is deprived of its theoretical and practical basis. All the assumptions obtained by geophysical measurements are closely connected with geology because the main difficulty of geophysical methods, which is based on the Newton-Gauss theory of the potential, consists in the multiplicity of interpretations that can be given to the results of measurements of the distribution of the physical properties on the surface of the earth's crust. In order to reduce this multiplicity of interpretations a knowledge of the geological structure of the area under investigation, as well as the possibility of geological interpretation of the results of geophysical measurements, is

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indispensable. The author himself considers that the "reduction of the multiplicity of interpretations to a series of cases important in practice" is the fundamental task of the work and tries to solve this problem in a general way, although the aid of geology may be especially useful in single cases when all the individual particularities are taken into consideration.

These standardized cases are, in the opinion of the author, the following: When above the antenna (oscillator) situated on the ground there are in the sphere of its action: (1) Dry rocks, (2) an oil horizon, (3) a reservoir of sweet water, (4) of salt water, or (5) an ore body. In the last three cases it is supposed that the waters or ore bodies have a horizontal position and are covered with dry over-burden; the terrain is supposed to be a "Tafelland" (plateau). The physical characteristics of these five cases are given in the following table:

	1. Dry rocks	2. Horizons Impregnated with oil	3. Rocks carrying sweet water	4. Rocks carrying salt water	5. Rocks containing ore
Dielectric constant ε	7	$7<\varepsilon_2<80$	80	80	<80
Conductivity δ	10^3	10^3	10^8	10^{11}	10^{13}

The enumeration of these possible cases show their incompleteness, insufficiency, and dependency on a geological diagnosis.

The author declares that by measuring at one point the natural frequency (λ - Eigenfrequenz) and the time damping (Zeitliche Dämpfung - δ) the question of which of the five configurations is under the surface can be determined directly. The results of the measurements expressed in the form of points with relation to the system of coordinates λ, δ, are distributed on four curves (hyperbola) corresponding to the cases 2 to 5; these curves intersect in one point, the latter corresponding to configuration one. The points outside of the curves are not interpreted by the author. The possibility of many results is, in the opinion of the author, not important from the practical viewpoint and may only cause the omission of the deposit.

Based on his method the author thinks it possible to go over from the bulk analysis of the earth's crust (rocks $\delta = 0 - 10^3$; water, ore $\delta = 10^8 - 10^{13}$) to the detailed analysis according to the above mentioned-method, the main value of which consists in the possibility of prospecting for oil in dry regions. The method can not be used in case of wet ground and so far has theoretical value only. The practical application of this method is desirable.-- V. Gorsky.

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5. RADIOACTIVE METHODS

UEBER VERSUCHE MIT DEM ELEKTRONENZÄHLROHR

(ON THE EXPERIMENTS WITH AN ELECTRON TUBE-COUNTER)

By A. K. Das and K. Wölcken

Physikalische Zeitschrift, vol. 31, No. 3, 1930, pp. 136-139.

In the first part of the article the authors describe the tube-counter and note the experience obtained with regard to the manufacturing of it.

In the second part the results of the experiments with Ra- γ-radiation are given. The values do not differ much from those published by some other authors.

Tables showing the determination of the sensitivity of the tube-counters and the absorption of Ra- γ-radiation by lead are given. The dependence of the intensity of radiation with regard to the distance is shown.--W. Ayvazoglou.

6. GEOTHERMAL METHODS

THE INTERNAL TEMPERATURE OF THE EARTH'S CRUST

By Frank M. Gentry

Science, vol. 70, No. 1,814, 1929, pp. 332-334.

Taking into consideration that the linear gradient of 1° F. in 55 feet is not satisfactory because it leads to large errors at even shallow depths, and that Kelvin's equation, although of considerable theoretical background, does not take account of internal heating which may arise from causes other than the original molten conditions (such, for example, as those of radioactivity, chemical activity, etc.) Gentry discusses in this article the possibility of obtaining equations which would represent the average temperature gradient of the earth's crust.

According to the author the calculations of temperature in the earth's crust made with equations derived by him check exceedingly well, on the whole, with the temperature measurements that have been made by Van Orstrand, Hallock, and others on the world's deepest wells. He adds that, of course, care must be exercised in applying the formulas to oil and Artesian wells, unless the depth of the source of flow be accurately known, for, if the seepage is from a greater depth than the bottom of the well, the temperature of the discharge will be far higher than the computed quantity. On the other hand, if the well taps a fissure short of the bottom, the temperature of discharge will be less than the computed value. Departures from the computed values may be attributed also to variations in the thermal conductivity of the rock.--W. Ayvazoglou.

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GEOTHERMAL DETERMINATIONS IN THE WELLS TESP IV IN KALUSZ

(In Polish)

By S. Zych and A. Tabor

Institut de Géophysique et de Météorologie de l'Université de Lwow (Poland). Communications, vol. 3, No. 32, 1928, pp. 885-892.

The authors give a table showing the temperatures at different depths according to observations made in wells Tesp IV in Kalusz. The figures, as compared with those obtained in the petroliferous region of Krosno, Boryslaw, and Bitkow are of great interest.

The mean geothermal degree in Kalusz is 31.5 meters, a figure which is almost identical with that established by Daly for some other parts in Europe.

In comparison with the temperatures in the wells Kornhaber II, in Boryslaw an increase of from 2.6° at a depth of 200 meters to 5.6° at 1,000 meters has been observed.

The authors established that, if compared with temperatures measured at Paruszowice, in Silesia, those at Kalusz are higher beginning with a depth of 770 meters, while at smaller depths the difference is not significant. Professor Arctowski explains this difference by isostasy.--W. Ayvazoglou.

7. UNCLASSIFIED METHODS.

PROSPECTIONS GÉOPHYSIQUE EN LIMAGNE

(GEOPHYSICAL PROSPECTING IN LIMAGNE)

By M. P. Geoffroy

Annales de l'office national des combustibles liquides, No. 4, July-August, 1929, pp. 617-649.

In this article Geoffroy gives geological interpretations of the data obtained from the following geophysical prospections: (1) Gravimetrical prospection for oil in the region of southern Limagne carried out by Dr. Pekar, Director of Baron Roland Eötvös Institute in Budapest, at the request of the National Office of Combustible Liquids, and (2) Electrical prospecting by Schlumberger's method carried out between Clermont-Ferrand and Riom.

Gravimetrical work was done during the summer months (July to September) of 1927 and 1928. One hundred and ninety-eight square kilometers were explored by the Eotvos torsion balance. The number of stations investigated was 144. Both reports are provided with many tables and maps added to this article.

Geoffroy utilized besides the results of geological studies made by several geologists, observations made by himself and data obtained by drilling.

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According to the author, geophysical measurements do not always furnish sufficiently decisive arguments. In his opinion this can be explained by the fact that the prospection includes two very distinct problems: The first consists of the determination of geophysical anomalies, and can be solved with great precision. The second, that of geological interpretation, is much less certain, and the results arrived at are often no better than those obtained with ordinary methods of mining, especially those of drilling.

A geological structure of the region investigation is given.--W. Ayvazoglou.

MODERN PROSPECTING

By A. S. Eve

The Times Trade and Engineering Supplement (Canada Section), vol. 25, No. 595, 1929, pp. 58-59.

A brief review of geophysical methods of prospecting (magnetic, electrical, gravitational, and seismic) is given. In conclusion the author says that geophysical methods are in a state of rapid development and evolution, that progress is satisfactory and continuous, and that the chief causes of delay are perhaps assignable to the contempt of the sceptics and unbelievers who belittle the results and possibilities, and to oversanguine optimism of those who do not appreciate the difficulties and limitations.--W. Ayvazoglou.

APPLIED GEOPHYSICS, A NEW CONQUEST OF THE MINING INDUSTRY

(In Serbian)

By Vsevolod A. Gorsky

Rudarski i Topionicki Vesnik (Bulletin of Mining and Metallurgical Industry), Belgrade, vol. 1, No. 4, 1929, pp. 160-167.

Applied geophysics help the solution of the fundamental tasks of mining by rational prospecting of ores and safety of mining work. The purposes of practical application of geophysical methods of prospecting in the mining industry may be summed up as follows: (1) Removal of casual "wildcat" deep borings and diggings; (2) determination of the commercial value of a deposit almost independently of borings; (3) reducing the latter to the minimum necessary for the direct and sure disclosure of the deposit; (4) increasing of accuracy and safety of mining during the process of actual exploitation of the deposit.

The use of geophysical methods in the mining industry requires the solution and application of a series of vital tasks such as: (1) Establishment and active work of governmental institutions for geophysical prospecting by which all the defects of commercial undertakings may be avoided; (2) corresponding enlargement of the programs of mining schools; (3) changes in mining law with regard to a larger freedom in accomplishing geophysical and geological

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prospecting based on the fact that this prospecting does not require damage of the earth's surface; (4) close and mutual cooperation of geologists, geophysicists, and mining engineers.

Positive qualities and advantages of geophysical methods of prospecting: (1) Objectivity, quantity, and accuracy of the results obtained by geophysical measurements; (2) application of methematico-instrumental methods; (3) obtaining of knowledge on the distribution of physical properties of geological strata over a large area; (4) independence of outcrops and an exclusive possibility of application in the regions covered with alluvium; (5) economy in boring and trenching and in the possibility of a correct distribution of expense in conducting the above; (6) cheapness as compared with deep boring and better results; (7) applicability for quick, and systematic investigations on a large scale of large areas; (8) increasing the accuracy in determining the probable geological structures and possibility for drawing conclusions based on analogy.--Author's abstract.

THE INSTITUTE OF SURVEYING OF MINES AND GEODESY AT THE UNIVERSITY IN LUBLIANA

(In Serbian)

By Vsevolod A. Gorsky

Rudarski i Topionicki Vesnik (Bulletin of Mining and Metallurgical Industry), Belgrade, vol. 1, No. 9, 1929, pp. 394-403.

A statement of the organization and work of the institute is given. The purpose of the institute consists also of the study and application of geophysical methods of prospecting. The possibility of a productive and easily effectuated application of these methods in Yugoslavia is discussed.--Author's abstract.

LA PROSPECTION A DISTANCE DU SOUS-SOL EST-ELLE POSSIBLE?

(IS THE PROSPECTION OF THE SUBSOIL AT A DISTANCE POSSIBLE?)

By Jules Henri

Le Nord Carbonnier, Lille, No. 5, April 12, 1929.

This article may be of interest, as it serves the purpose of distorting the nature and tasks of geophysical methods of prospecting and diverting the attention of mining organizations to the unscientific or quasi scientific, fantastic methods which to a certain degree may be compared with the "divining rod." The author propagates the use and discusses the tests and theories made by J. Jeannet ("Radioscopy"), Abbe Bouly ("Radies-thesie", and Schermuly ("Polarization"), which do not much differ from the problematic methods proposed by Pastor ("Radioemanation"), H. Mayer ("Vibration of ether"), and others.

Scientific and applied geophysics must be on guard and must protect themselves against these questionable methods which may throw a shade upon

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scientific and useful methods. The mining organizations must be warned against working with persons and organizations using these or similar methods.--V. Gorsky.

GEOPHYSICAL METHODS OF PROSPECTING

(In Serbian)

By D. V. Frost

Technichki List (Technical Paper) No. 1, January, 1928, Zagreb, pp. 6-9.

The author gives a brief review of the nature and sphere of application of geophysical methods of prospecting.--V. Gorsky.

GEOPHYSICAL AND GEODETIC MEASUREMENTS IN THE PRIBRASH MINES

(In Bohemian)

By F. Cehura

Comptes rendus de 1-er Congrès des géographes et ethnographes slaves. Prague, 1926.

The author reports the magnetic, gravitational, seismic, geothermal, and other observations made at various times by Sterneck, the author himself, and others in the Pribrash mines. The results of these observations are given.--V. Gorsky.

GEOPHYSICAL PROSPECTING IN 1929

By Donald H. McLaughlin

Mining and Metallurgy, vol. 11, No. 277, 1930, pp. 26-28.

In this article McLaughlin gives a summary of geophysical prospecting work accomplished in 1929 which, in his opinion, is making encouraging progress toward finding its proper place and function in engineering and geological practice. New devices have been tried out, instruments and technique have been improved, and the methods of application to commercial problems have been increased in many ways within the last year. Different methods of prospecting are examined and the lines of their application discussed. In the last section of the article McLaughlin considers the question of the proper training for young men who plan to follow geophysical prospecting, as this is still a debatable subject and is yet to be solved in the best way.--W. Ayvazoglou.

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GEOPHYSICAL EXPLORATION FOR ORES

By Max Mason

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 9-44.

A brief outline of the basic problem of physical exploration is given and the methods by which practical work may be carried out are mentioned.

A critical valuation and understanding of the real nature of these methods, as well as the means by which practical methods are evolved, are discussed in this article under the following headings: (1) The physicist's work; (2) mathematics applied to detecting ores; (3) how the physicist proceeds; (4) use of models; (5) detectability by electrical method -- four factors; (6) depth frequently overstated; (7) a practical rule; (8) difficulties of interpreting results the great obstacle; (9) economic aspects; (10) the cost of prospecting; (11) no physical method detects ore, and (12) underground exploration an attractive field.--W. Ayvazoglou.

GEOPHYSICS AND THE MINING ENGINEER

By Allen H. Rogers

American Institute of Mining and Metallurgical Engineers, Geophysical Prospecting, 1929, pp. 44-51.

Geophysical prospecting methods have become an important factor of assistance to the mining engineer in solving his most difficult problem--that of finding the ore. Contents of the article: (1) Help in finding the ore; (2) symptoms of presence of ore; (3) principles of geophysics; (4) application of geophysical methods; (5) cost of electrical prospecting.--W. Ayvazoglou.

DAS METEROOLOGISCHE OBSERVATORIUM ZU ANGORA

(THE METEROLOGICAL OBSERVATORY IN ANGORA)

By A. Rethly

Gerlands Beiträge zur Geophysik, vol. 24, No. 4, 1929, pp. 381-383.

The author, who at the request of the Turkish government took charge of the organization of meteorological service in that country, describes the erection of a new meteorological observatory near Angora. The geographical position of the observatory is as follows: Longitude east from Greenwich 32° 48'; north latitude 39° 58'; above sea level 860.8 meters.--W.Ayvazoglou.

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GEOPHYSICAL TESTS AT BENDINGO (VICTORIA)

Editorial note

Industrial Australian and Mining Standard,
vol. 83, No. 2,128, 1930, p. 75.

The New Red, White, and Blue Co., Bendingo (Victoria), has reported that the geophysical tests made by S. Anderson have indicated the presence of auriferous formations at a depth of 170 feet, and above the 380-foot and 640-foot levels. Work on the reef over the 690-foot level disclosed gold. Mr. Anderson's tests were carried out chiefly in the south part of the property, where a large area of unworked ground is available. The reefs indicated can be reached by present levels from the south shaft. The spurry formation at 170 feet will be examined by the company. Mr. Anderson will make a geophysical survey of the Ironbark and Hercules mines, and will later carry out some tests on the Maldon field.

LOCATION OF SALT DOMES BY GEOPHYSICAL METHODS IS SUCCESSFUL ON GULF COAST

Editorial note

Oil Field Engineering, vol. 7, No. 1, 1930, pp. 44-46.

The success in locating salt domes almost exclusively by geophysics since 1925 is mentioned, and the definite results obtained on the Gulf Coast are given. Up to the present the seismic method and torsion balance have been the only geophysical methods credited with salt dome discoveries in this region. Of the total of 158 salt domes, 68 are reported to have been located without the aid of geophysics, 20 by the torsion balance, and 70 by the seismic method. Of a total of 80 domes tabulated by the Department of Conservation of the State of Louisiana for the coastal region of that State, 62 were discovered by geophysical methods (55 by the seismic method; 4 by the torsion balance, 2 by the seismograph and torsion balance, and 1 by the geophone and torsion balance) and only 18 by drilling.

As the depths at which geophysical measurements are effective are matters of interest, some of the depths determined by drilling are given in the table below:

	Top of cap, feet	Top of salt, feet
Black Bayou	887	1,709
Bayou Boullion	1,000	1,645
Starks	1,299	2,218
Sorrento	1,617	2,785
East Hackberry	3,254	3,487
Napoleonville	4,013	6,066

A map of Louisiana showing productive and nonproductive salt domes, as well as oil and gas fields, is added.--W. Ayvazoglou.

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GEOPHYSICAL EXPLORATION OF THE EGYPTIAN RED SEA COAST

Editorial note

The Petroleum Times, vol. 23, No. 573, Jan., 1930, p. 10.

The Egyptian Ministry of Finances has arranged with the London Geophysical Co. to examine certain points on the Red Sea coast line. Seven German experts equipped with the latest scientific apparatus have left for Alexandria from where the Government vessel "Abdul Monain" will take them to the camp of Abou Shaar.

8. GEOLOGY

HYPOTHESES ON THE DEVELOPMENT OF THE EARTH

By B. Gutenberg

Journal of the Washington Academy of Sciences, vol. 20, No. 2, Jan., 1930, pp. 17-25.

In a brief sketch Gutenberg gives an explanation of the evolution of the earth on the basis of forces that must be expected according to the theory, such as: (1) Chemical forces and gravity, (2) cosmical forces, (3) forces caused by the deviation of the earth's crust from hydrostatic pressure, (4) forces caused by the cooling of the earth and the crystallizing of the matter in the earth's interior, (5) movements of masses caused by erosion and sedimentation, (6) "Polflucht" forces (forces which strive to move the continents against the equator), and (7) stresses caused by movements of the earth's crust relative to the axes of the earth. According to the author the explanation is in good agreement with a great many observations.

A fuller explanation of the hypotheses on the development of the earth is given in the "Handbuch der Geophysik," vol. 3, of the same author.--W. Ayvazoglou.

GEOLOGY OF THE PETROLIFEROUS DISTRICT OF MAJEVICA IN S. H. S.

(In Serbian)

By M. Luković

Rudarski i Topionicki Vesnik (Bulletin of Mining and Metallurgical Industry), Belgrade, vol. 1, No. 2, 1929, pp. 49-58.

The mountainous region of Majevica, in the southeastern part of Bosnia, is covered mostly with Tertiary formations and is rich in outcrops of natural gas, salt and sulphur springs, and also has many indications of oil connected with the Eozoic deposits. Based on his own observations, Lukovic gives a stratigraphic and tectonic description of the region which resembles, concerning the geology, the Carpathian paleogene oil zone and which, owing to its structure, is the most promising district for finding oil in Yugoslavia.

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The region must be considered to be very interesting for geophysical prospecting.--V. Gorsky.

GEOLOGY AND ORE DEPOSITS AROUND RASKA AND NOVI PASER

(In Serbian)

By M. Lukovic

Rudarski i Topionicki Vesnik (Bulletin of Mining and Metallurgical Industry), Belgrade, vol. 1, No. 10, 1929, pp. 435-452.

The geological investigation made by Lukovic concerns a small area of the large ore district extending from Srebrnica in Bosnia to Yaniv and Novi Brd near Pristina in northern Macedonia. The mining development in this district, principally by English and French capital, is becoming very intensive.

The district described has many outcrops and deposits of chromite and magnesite mixed with serpentine, galena containing silver, sphalerite, pyrite, arseno-pyrite, and chalko-pyrite accompanied by quartz in connection with andesites and trachytes of the Miocene and Pliocene epochs; there are besides some unimportant deposits of Senonian coal.

Lead-zinc deposits belong to the well-known type of deposits formed from the hot mineral solutions at medium and small depths; they may be of commercial value. The electrical method of prospecting would probably be successful.

Means of communication are satisfactory, and most of the outcrops and old works are situated close to the just completed Kralievo-Raska railway line. --W. Ayvazoglou.

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9. NEW BOOKS

Berroth, A. Schweremessungen (Gravity measurements). 70 pp., 46 figs. From: Handbuch der Physik (Manual of physics), published by H. Geiger and K. Scheel. Vol. 2, Berlin, Julius Springer, 1928, pp. 416-486. Contents: (1) Determination of the field of gravity of the earth in general. (2) Measurements of the direction of gravity. (3) Measurements of the intensity of gravity with pendulums. (4) Measurements of gravity gradients (torsion balance). (5) Disturbances of the force of gravity caused by the sun and the moon. (6) Some other relations to the force of gravity.

Bowie, W. Isostasy. XIV and 275 pp. with 39 figs. New York, E. P. Dutton and Co., price $5. Contents: (1) The development of the isostatic theory. (2) Quantitative test of isostatic theory. (3) Assumptions underlying computations of isostatic effect. (4) Isostatic condition of earth's crust under various classes of terrain. (5) Some geodetic and geophysical deductions from the proof of isostasy. (6) Some phases of isostatic adjustment. (7) The influence of isostasy on geological deductions. (8) Processes involved in crustal and subcrustal movements. (9) Proposed theory, in harmony with isostasy, to account for major changes in the elevation of the earth's surface.

Eve, A. S., and Keys, D. A. Applied Geophysics in the Search for Minerals. Cambridge University Press, London, 1929, 244 pp. Illustrations. $4.50

Gutenberg, B. Handbuch der Geophysik. Band 4, Lieferung 1, Berlin, Gebr. Borntraeger, 1929, 298 pp. Contents: Theory of earthquake waves; observations; disturbances of the ground.

Hecker, O., and Meissner, O. Irdische Schwere (Terrestrial Gravity), 33 pp. 44 figs. From: Handbuch der Physikalischen und Technischen Mechanik (Manual of physical and technical mechanics), edited by F. Auerbach and W. Hort. Vol. 2, No. 1, Leipzig, Johann Ambrosius, Barth, 1928, pp. 148-181. Contents: (1) Level equipotential surfaces and gravity. (2) Experimental determination of gravity. (3) Mean density of the earth and the gravity constant.

Jeffreys, H. The Earth, its Origin, History and Physical Constitution. 2nd ed. XI and 346 pp. with 16 figs. and 3 tables. Cambridge University Press, 1929. Price: 20 sh. Contents: Introduction. (1) The nebular hypothesis of Laplace. (2) The tidal theory of the origin of the solar system. (3) The origin of the moon. (4) The resisting medium. (5) The age of the earth. (6) Seismology: General considerations and structure of the upper layers. (7) Seismology: The earth's interior. (8) The thermal history of the earth. (9) The equation of motion of an elastic solid with initial stress. (10) The bending of the earth's crust by the weight of mountain. (11) The theory of isostasy. (12) The figures of the earth and moon. (13) The variation of latitude and the bodily tide. (14) Tidal friction. (15) The origin of the earth's surface features. Appendix: The planteisimal hypothesis. Jean's theory. The relation of mathematical physics to geology. Theories of climatic variation. Empirical periodicities.

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Kirsch, G. Geologie und Radioactivität (Geology and radioactivity). VIII and 214 pp., 48 figs. Berlin, Julius Springer, 1928. Price: Stitched, R.M. 16; bound, R.M. 17 - 60. Contents: Introduction and brief summary on radioactivity. (1) Distribution of radioactive substances. (2) Radioactive substances as sources of energy. (3) Determination of age based on radioactivity.

Kohlrausch, K. W. F. Handbuch der Experimentalphysik (Handbook of experimental physics). Vol. 15, Radioactivity; X and 885 pp., 285 figs. Leipzig, 1928. Akademische Verlagsgesellschaft m. b. H. Price: stitched, R. M. 79; bound, R. M. 81. Contents: (1) Preface. (2) δ -radiation. (3) β -radiation. (4) α -radiation. (5) Reflection-radiation. (6) Various effects of radiactive radiation. (7) Laws of radioactive changes. (8) Methods of measurements of radioactivity. (9) Radioactive substance. (10) The atomic nucleus.

Maurain, Ch., Brazier, C. - E., Eble, L., Labrouste, H., Salles, Ed. Données Numerique de Physique du Globe (Numerical data on the physics of the earth). VII and 60 pp. Paris, Gauthier Villars et Cie., 1928. Price: stitched, 34 fr.; bound, 50 fr. Contents: (1) Form of the earth; Density; Gravity. (2) Seismology. (3) Terrestrial magnetism. (4) Atmospheric electricity. (5) Aurora polaris. (6) Radioactivity. (7) Solar radiation, atmospheric and terrestrial. (8) Meteorology.

Meyer, St., and Schweidler, E. Radioaktivität (Radioactivity). Chapter VII: Radioactivity in geophysic and cosmic physic. 2nd ed., enlarged and revised. Leipzig and Berlin, B. G. Teubner, 1927, pp. 546-624. Contents: (1) Radioactivity of minerals and rocks. (2) Radioactivity and the temperature of the earth. (3) Determination of age of minerals and rocks. (4) Radioactivity of waters. (5) Radioactivity of the atmosphere. (6) Radioactivity of the ground air. (7) The ionization in closed vessels and the penetrating radiation. (8) Participation of radioactive radiation on the ionization of the atmosphere. (9) Cosmic radioactivity.

Mitteilungen der Badischen Geologischen Landesanstalt (Report of the Geological Institution of Baden). Herausgegeben im Auftrage des Finanzministerium. Vol. 10, No. 1, Freiburg i. B. Verlagsbuchlandlung Herder and Co., 1928, 233 pp., 13 figs., 17 tables. Price: stitched, R. M. 15. Contents: Haseman, W.: Geology and tectonic of the vicinity of Eberbach in Odenwald. Holst, Dr. H.: Torsion balance measurements in Schauinsland near Freiburg i. Br. and their geologic interpretation.

Müller - Pouillets. Lehrbuch der Physik (Manual of Physics). pt. 1. Physics of the earth. 11th ed., vol. 5, Braunschweig, Friedr. Vieweg and Sohn A.-G., 1928, XVIII and 840 pp., 341 figs., 7 tables. Price: stitched, R.M. 49. Contents: Mechanics and thermodynamics of the earth body; Gutenberg: The development of the earth; Observations concerning gravity and isostasy; Movement of the axis of the earth and polar movements; Tides of the earth body; The form of the earth; Density of the earth and the pressure inside of the earth; The constitution of the earth. Wiechert: Theory of gravity; geoid, geodesy.

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Nippoldt, A., Kerränen, J., Schweidler, E. Einführung in die Geophysik II. Erdmagnetismus und Polarlicht. Wärme - und Temperaturverhältnisse der der obersten Bodenschichten. Luftelektrizität. Berlin, Julius Springer, 1929, X and 388 pp., 130 figs.

Pesonen, U. Relative Bestimmungen der Schwerkraft auf den Dreieckspunkten der südfinnischen Triangulation in den Jahren 1924-1925. (Relative determinations of gravity at the triangulation points of the trigonometrical survey in southern Finland in 1924-1925). (Publication of the Finnish Geodetic Institute, No. 9). 129 pp., 2 figs., Helsinki, 1927. Contents: (1) Historical introduction. (2) Apparatus. (3) Method of observation. (4) Formulas used for calculations. (5) Determination of constants. (6) Determinations of gravity difference: Astronomical observatory of the physical laboratory in Helsingfors, 1924. (7) Field observations made in 1924. (8) Gravity difference between the old and new stations in Helsingfors. (9) Field observations made in 1925. (10) Deduction of gravity.

Pressel, K. Experimentelle Methode der Vorausbestimmung der Gesteinstemperatur im Innern eines Gebirgsmassivs (An experimental method of the predetermination of rock temperature inside of a mountain massif). München und Berlin, Verlag von R. Oldenbourg, 1928, 58 pp., 12 + 11 figs., 4 tables and 15 numeral tables. Price: stitched, R. M. 10. Contents: Introduction. Electrical experimental method for the predetermination of rock temperature inside of the mountain massif. (1) Brief summary on the method and results of it applied in the tunnel areas of the Simplon and Gotthard. (2) Details concerning the arrangement and execution of the experiments. Appendix: Device for the measurement of curves constructed by Pressel and Riefler.

Schmiedel, O. Das Alter der Erde nach dem Abkühlungsprocess (The age of the earth according to the process of cooling. Berlin, Ferd. Dümmlers Verlag, 1927, 70 pp. with 12 figs. Price: stitched, R.M. 4. Contents: (1) Geophysical and geographic details as foundations for the investigation. (2) The development of heat caused by contraction from the condition of mist. (3) Cooling of the earth's body. (4) Effect caused by irregular cooling of the surface. (5) The time of the formation of seas followed from the drop of the temperature on the surface. (6) Compensation of heat by the corresponding contraction of the earth caused by cooling. (7) The period of the formation of the crust.

Sieberg, August. Geologische Einführung in die Geophysik. (Geological introduction to geophysics). Iena, Gustav Fischer, 1927, X and 374 pp. with 260 figs. and one colored map. Price: bound, R.M. 19. Contents: Preface. (1) The earth planet. (2) Internal structure and physical conditions of the earth body. (3) Position of the earth in the universe and the process of the development. (4) The weight of the earth. (5) Earth magnetic and similar phenomena. (6) The magnetic proceedings. (7) The tectonic proceedings. (8) The seismic proceedings. (9) Earthquakes.

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Verhandlungen der in Riga vom 20 bis 23 Mai 1927 abgehaltenen dritten Tagung der Baltischen Geodätischen Kommission. (Transactions of the third session of the Baltic Geodetic Committee held from May 20 to May 23, 1927.) Edited by Ilmari Bonsdorff, General Secretary. Helsinki, Kirjapeino - Oy. Sana, 1928, 159 pp. with 10 figs. Contents: Earthmagnetic measurements in Estonia. Kohlschütter, E.: On the forms of pendulums. The new pendulum apparatus of the Prussian Geodetic Institute. A proceeding by which the oscillation of the one-pendulum support may be determined from the time of oscillation of two pendulums. Schmehl, H.: On a simple "Coincidence - proceeding" for starting the movement of two gravity pendulums with a given phase difference. Chantelou, J. F., Linear determinations of the Danish grade measurement. The measurement of the fundamental lines. Adjusting of the net. Connection of the lengths of the center lines of the country. Gravity measurements. Magnetic measurements. Determinations on the common measurements.

Wegener, A. Die Entstehung der Kontinente und Ozeane. (The origin of continents and oceans). Braunschweig, Friedr. Vieweg and Sohn A.-G., 1929, 4th ed. X and 231 pp. with 63 figs. Price: stitched, R.M. 10. - bound, 12. Contents: (1) Historical notes. (2) The nature of the theory of the shifting and its relation to the existing ideas of the changes of the surface of the earth during the geological periods. (3) Geodetical arguments. (4) Geophysical arguments. (5) Geological arguments. (6) Paleontological and biological arguments. (7) Paleodimatic arguments. (8) Fundamental remarks on the shifting of continents and pole movements. (9) The moving forces. (10) Supplementary remarks on the sial sphere. (11) Supplementary remarks on the deep sea bottoms.

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